

CLAIMS

1. An auxiliary agitator for a flotation device of the type having a tank, a primary agitator including a primary rotor, drive means, and a drive shaft disposed intermediate the drive means and the primary rotor, the auxiliary agitator including:
an auxiliary agitation blade adapted, in use, to supplement an axial flow induced in the tank by the primary rotor; and
connecting means for connecting the blade to the drive shaft intermediate the drive means and the primary rotor.
2. An agitator according to claim 1, wherein the auxiliary agitation blade defines an angle of incidence that is substantially constant along the length of the blade, as in an axial impeller.
3. An agitator according to claim 2, wherein the angle of incidence is between 15 degrees and around 75 degrees with respect to the direction of travel of the blade.
4. An agitator according to claim 1, wherein the auxiliary agitation blade defines an angle of incidence that varies along the length of the blade, as in a propeller.
5. An agitator according to claim 1, wherein the pitch of the blade is adjustable depending on specific system parameters, such as slurry density, slurry viscosity or flow characteristics within the tank.
6. An agitator according to any one of the preceding claims, wherein the blade includes a substantially straight leading edge.
7. An agitator according to any one of claims 1 to 5, wherein the leading edge of the blade is curved.
8. An agitator according to any one of the preceding claims, wherein the blade is releasably connected to the shaft to allow its position relative to the primary rotor to be adjusted.
9. An agitator according to any one of the preceding claims, wherein, in use, the blade is connected to the shaft at around a midheight of the tank.
10. An agitator according to any one of the preceding claims, wherein the connecting means include a clamp.
11. An agitator according to claim 10, wherein the clamp is formed of two inter-engageable clamping halves.
12. An agitator according to claim 11, wherein the two clamping halves are substantially identical.
13. An agitator according to any one of claims 10 to 12, wherein inner walls of the clamp together define a generally cylindrical clamping surface.

14. An agitator according to any one of claims 1 to 9, wherein the connecting means take the form of welds or bolts.
15. An agitator according to any one of the preceding claims, including a resilient protective layer coating its exterior surfaces.
16. An agitator according to claim 15, wherein the protective layer is greater than around 3mm thick.
17. An agitator according to claim 14 or claim 15, wherein the protective layer is between around 5mm and around 7mm thick.
18. An agitator according to any one of the preceding claims, including a pair of the auxiliary blades, in use extending radially outwardly from diametrically opposite sides of the shaft, each blade having associated connecting means.
19. An agitator according to any one of claims 1 to 18, including at least three of the blades, in use equally spaced around the perimeter of the shaft, each blade having associated connecting means.
20. An agitator according to claim 18 or claim 19, wherein, in use, each blade intersects the shaft at an angle of incidence of around 45 degrees.
21. Agitation means for a flotation device of the type having a tank, a primary agitator including a primary rotor, drive means, and a drive shaft disposed intermediate the drive means and the primary rotor, said agitation means including:
 - a drive shaft;
 - a primary rotor connected to one end of the drive shaft to form the primary agitator; and
 - an auxiliary agitator as defined in any one of claims 1 to 20.
22. Agitation means according to claim 21, wherein the auxiliary agitation blade is releasably connected to the shaft to allow its position relative to the primary rotor to be adjusted.
23. Agitation means according to claim 21 or claim 22, being adapted for use in a three phase environment including water, solids and air.
24. A flotation device including:
 - a tank for containing slurry incorporating minerals to be extracted;
 - a feed inlet for admission of slurry into the tank;
 - agitation means, as defined in any one of claims 21 to 23, to agitate the slurry within the tank; and
 - aeration means to aerate the slurry whereby floatable minerals in suspension form a surface froth.

25. A flotation device according to claim 24, including a stator surrounding the rotor.
26. A flotation device according to claim 24 or claim 25, including a peripheral overflow launder extending around the inside top of the tank for recovering mineral enriched froth from the surface.
27. A flotation device according to any one of claims 24 to 26, wherein the aeration means include an air blower and a fluid conduit for directing air from the blower into the rotor.
28. A flotation device according to claim 27, wherein the conduit includes an axial bore extending through the drive shaft.
29. A flotation device according to claim 27 or claim 28, wherein the conduit is disposed to direct air into the rotor from underneath.
30. A flotation device according to any one of claims 24 to 29, including a froth deflection cone extending around the drive shaft adjacent the top of the tank, the smallest diameter of the cone being at its lowermost end nearest the rotor.
31. A flotation device according to claim 30, wherein the deflection cone is disposed to deflect froth outwardly toward the overflow launder as it migrates toward the surface of the tank.
32. A flotation device according to claim 30 or claim 31, wherein the deflection cone is disposed to prevent vortexing at the tank surface.
34. A flotation device according to any one of claims 30 to 32, wherein the auxiliary agitator is located substantially midway between the top of the rotor and the bottom of the deflection cone.
35. A flotation device according to any one of claims 30 to 34, including a reagent addition tube extending downwardly into the tank through the deflection cone.
36. An auxiliary agitator as defined in any one of the preceding claims, adapted for agitating a slurry containing up to around 55% solids.
37. An auxiliary agitator as defined in any one of the preceding claims, adapted for use in a flotation device having a tank with a capacity of at least 50m³.
38. An auxiliary agitator as defined in any one of the preceding claims, wherein the auxiliary agitation blade, in use, acts as an axial impeller to supplement an axial flow induced in the tank by the primary rotor.
39. An auxiliary agitator as defined in claim 37, wherein said axial impeller has a diameter of around 15% to around 35% of the tank diameter.